

CLAIMS:

1. An energetic beam markable article comprising:
a first substrate;
5 a first layer on the first substrate, the first layer comprising:
one or more first areas comprising:
a thermally coalescable material wherein the thermally
coalescable material within the one or more first areas is characterized by an
average dispersed body size; and
10 one or more second areas comprising:
the thermally coalescable material, wherein the thermally
coalescable material within the one or more second areas is coalesced into
bodies characterized by an average dimension that substantially exceeds the
average dispersed body size.
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2. The energetic beam markable article according to claim 1 wherein:
the average dispersed body size is less than 400 nanometers.
3. The energetic beam markable article according to claim 1 further comprising:
20 a second substrate covering the first layer, whereby the first layer is
sandwiched between the first substrate and the second substrate; and
wherein at least one of the first and second substrates is transparent.

4. The energetic beam markable article according to claim 3 wherein:
the first substrate comprises a first thermoelastic film; and
the second substrate comprises a second thermoelastic film.
- 5 5. The energetic beam markable article according to claim 1 wherein:
the first substrate comprises a thermoelastic film.
6. The energetic beam markable article according to claim 5 wherein:
the thermoelastic film comprises a polymer selected from the group consisting
10 of: polycarbonate, poly (ethylene terephthalate), and poly (butylene terephthalate).
7. The energetic beam markable article according to claim 1 wherein the
thermally coalescable material comprises particles comprising a polymer.
- 15 8. The energetic beam markable article according to claim 2 wherein the
thermally coalescable material comprises polymeric particles selected from the group
consisting of: poly (methacrylate), poly (vinyl acetate), styrene-butadiene-
acrylonitrile copolymers.
- 20 9. An energetic beam markable article according to claim 1 wherein:
the first layer further comprises a continuous phase wherein the
thermally coalescable material within the one or more first areas is dispersed
within the continuous phase.

10. The energetic beam markable article according to claim 1 wherein:

the first layer comprises :

a quantity of solvent;

a quantity of emulsifier, at least a portion of which is in the

5 form of micelles dispersed within the solvent; and

a quantity of polymerization initiator dispersed in the solvent;

and

the thermally coalesceable material comprises a quantity of monomer

dispersed within the solvent.

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11. The energetic beam markable article according to claim 10 wherein the first layer further comprises:

capsules and wherein the quantity of solvent, the quantity of monomer,

and the quantity of emulsifier, and the quantity of polymerization initiator are

15 encapsulated within the capsules.

12. The energetic beam markable article according to claim 1 further comprising:
a heat reflecting second layer on the first substrate.

20 13. The energetic beam markable article according to claim 1 made by a process including exposing one or more shaped areas of the layer to optical radiation to fuse the coalesceable material, and form the one or more second areas.

14. An injection molded part comprising:
a bulk of injected molded polymer; and
the energetic beam markable article according to claim 1 fused to the bulk of injected molded polymer.

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15. The injection molded part according to claim 14, wherein:
the energetic beam markable article is fused to the bulk of injected molded polymer in the course of injecting polymer into a mold to form the injection molded part.

16. An energetic beam markable article comprising:

a layer of polymeric particles, wherein the polymeric particles
comprise:

5 a core characterized by a first color; and
a shell characterized by a second color.

17. The energetic beam markable article according to claim 16 further comprising:

10 a first thermoplastic sheet, and a second thermoplastic sheet wherein the layer
of polymeric particles is disposed between the first thermoplastic sheet and the second
thermoplastic sheet.

18. The energetic beam markable article according to claim 17 further comprising:

a heat reflecting second layer supported on the first thermoplastic sheet.

19. An energetic beam markable article comprising:

a first substrate;

a first layer on the first substrate, the first layer comprising:

one or more first areas comprising:

5 a quantity of polymerizable monomer;

a network of first polymer molecules dispersed within
the polymerizable monomer, and held together by the
polymerizable monomer thereby forming a gel.

10 20. The energetic beam markable article according to claim 19 wherein:

the quantity of polymerizable monomer comprises one or more
monomers selected from the group consisting of methacrylates, vinyl acetate, styrene,
butadiene, and acrylonitrile.

15 21. The energetic beam markable article according to claim 19 wherein:

the network of first polymer molecules comprises one or more
polymers selected from the group consisting of poly(N-isopropylacrylamide),
poly(organotriethoxysilanes), and poly(vinyl alcohol-co-vinyl acetate)/poly(acrylic
acid).

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22. The energetic beam markable article according to claim 20 further comprising:
a heat reflecting second layer supported on the first substrate.

23. The energetic beam markable article according to claim 19 wherein the layer further comprises:

one or more second areas comprising:

a quantity of the first polymer molecules; and

5 a quantity of second polymer molecules that are a polymerization product of the polymerizable monomer.

24. The energetic beam markable article according to claim 23 made by a process including exposing one or more shaped areas of the layer to an energetic beam in
10 order to polymerize the polymerizable monomer.

25. A method of making an energetic beam markable article comprising:
dispersing a plurality of bodies of a first heat coalescable material
within a second material to form a plural phase material;
5 coating a substrate with the plural phase material to form a coating of
the plural phase material;
patternwise irradiating the coating of the plural phase material.
26. The method according to claim 25 wherein dispersing bodies of the first heat
10 coalescable material within the second material comprises:
forming a suspension of a plurality of polymeric particles in a liquid; and
mixing the liquid and a gel forming polymer to form a gel.
27. The method according to claim 25 wherein:
15 the plural phase material comprise a gel; and
patternwise irradiating the coating of the plural phase material comprises
patternwise heating of the gel above a sol-gel transition temperature of the gel.
28. The method according to claim 25 further comprising:
20 performing emulsion polymerization to make the plurality of bodies.

29. A method of making an energetic beam markable article comprising:
making a plurality of particle cores that are characterized by a first
color;
5 coating the plurality of particle cores with a coating characterized by a
second color; and
forming a layer of the plurality of particle cores with the coating.

30. The method according to claim 29 wherein coating the plurality of particle
10 cores comprises:
electrostatically suspending the plurality of particle cores while spraying the
plurality of particle cores with the coating material.

31. The method according to claim 29 wherein coating the plurality of particle
15 cores comprises:
tumbling the plurality of particle cores down a slope while spraying the
plurality of particle cores with the coating material.

32. The method according to claim 29 wherein coating the plurality of particle
20 cores comprises:
placing the plurality of particle cores within a liquid that includes the coating
material and in which the plurality of particle cores are buoyant;
allowing the plurality of particle cores to rise within the liquid; and
collecting the plurality of particle cores at a surface of the liquid.

33. The method according to claim 29 wherein coating the plurality of particle cores comprises:

5 placing the plurality of particle cores in a solution of polymerization catalyst to adsorb polymerization catalyst on the cores;

drying the cores to remove excess solvent; and

placing the cores in liquid including monomer to form a polymerized coating on the particles.

10 34. The method according to claim 29 wherein coating the plurality of particle cores comprises:

dispersing the plurality of particle cores in a colored liquid; and

15 metering the colored liquid including the plurality of particle cores onto a spinning disk, whereby Taylor instabilities in the colored liquid flowing off the spinning disk form droplets that include the plurality of particle cores coated with the colored liquid.